British Columbia Mineral Exploration Review 2000

BRITISH COLUMBIA

Information Circular 2001-1
Ministry of Energy and Mines

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COVER PHOTOS

Photo Captions in order top to bottom:

Photo #1: Fox Discovery - looking northwesterly across the Coquihalla Highway towards the Blacktop showing. Photo by T.G. Schroeter.

Photo #2: Remac project, southern B.C., - trench on the oxide zone. Photo by T.G. Schroeter.

Photo #3: Cariboo Gold Quartz project - Pot O'Gold core (under the rainbow), Bonanza Ledge zone. Photo by T.G. Schroeter.

Photo #4: Thorn, high-sulphidation Au prospect - looking southerly over the old camp and core storage, across La Jaune Creek toward the Main zone. Photo by T.G. Schroeter.

Photo #5: #5 Sustut property - looking north towards the Southeast zone. Photo by T.G. Schroeter.

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BRITISH COLUMBIA
2000 MINERAL EXPLORATION REVIEW

British Columbia Ministry of Energy and Mines

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INTRODUCTION

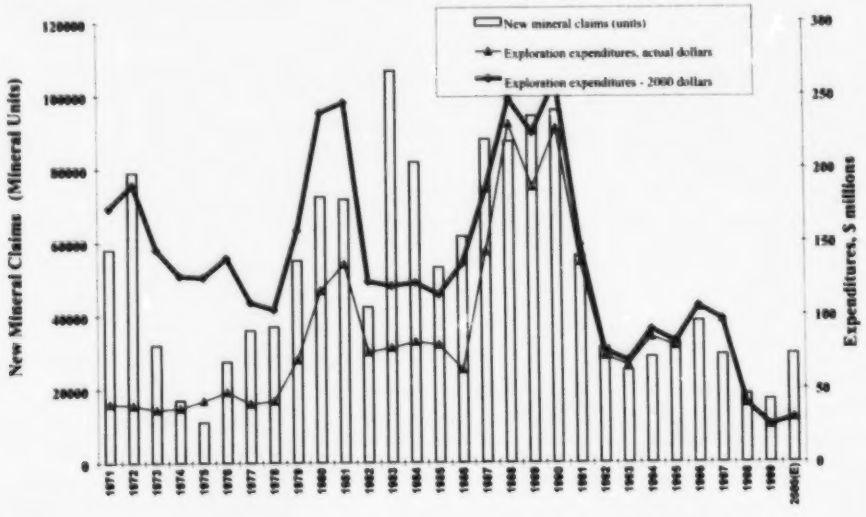
A number of new and exciting grassroots mineral discoveries stand out as exploration highlights during 2000. Many of these discoveries, made by prospectors, have already been optioned by junior mining companies; follow-up programs, including drilling, are proposed for next year. Early in the year International Wayside Gold Mines Ltd., exploring in the historic Wells-Barkerville camp, announced the discovery of the **Bonanza Ledge** zone, a new type of gold occurrence in the area. This sparked a staking rush along a 70 by 30 kilometre, northwest-trending belt. Later in the year Gitennes Exploration Inc. announced the discovery of volcanogenic massive sulphide (VMS) mineralization in Nicola Group rocks on the **Fox** property, north of Merritt. This discovery triggered the staking of over 1200 mineral units and has re-stimulated interest in the potential for VMS mineralization hosted by Nicola Group rocks elsewhere in south-central British Columbia. Other discoveries were made by prospectors and companies at **Spire**, **Broken Hill**, **Thorn** and **Silver Lynx**.

Redhawk Resources Inc., in a joint venture with ZincOx Resources Plc, drill tested the zinc oxide potential of the **Remac** deposits, 16 kilometres north of Cominco Ltd.'s Pend D'Oreille mine in Washington State. Metallurgical testing continues and results will be evaluated in 2001. The project reflects an interest in new zinc oxide recovery technology in the province.

On the advanced level, several porphyry deposits were examined, as part of a resurgence in base metal exploration. DRC Resources Inc. conducted deep drilling below the **Afton** pit, confirming and expanding a high-grade copper-gold resource which was previously drilled by Teck Corp.

The potential for **PGE** deposits in British Columbia received renewed interest, resulting in several property acqui-

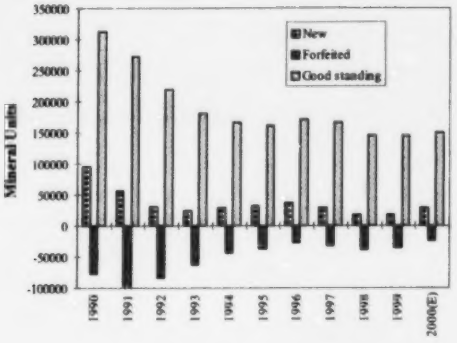
Figure 1...



Mineral exploration (fieldwork) expenditures and number of new mineral claims recorded in British Columbia: 1971 to 2000

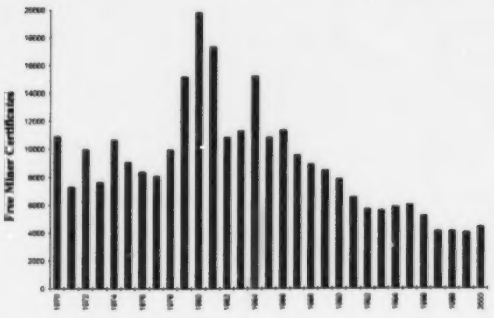
As in past years information obtained in this review, including tonnages and grades, are from data released by the individual owners or operators. The Ministry of Energy and Mines makes every effort to ensure accuracy in the information presented, however the Ministry is not responsible for any errors or omissions. Monetary figures are in Canadian dollars.
Readers should conduct their own inquiries and verify the information contained for themselves.

Figure 2 ...



Mineral units (new, forfeited, good standing); 1990 - 2000

Figure 3 ...



Free Miner Certificates: 1970 to 2000

sitions, including a mini-staking rush along a belt approximately 50 kilometres long, extending northwesterly from the Giant Mascot mine.

Doublestar Resources Ltd., which acquired all of Falconbridge Ltd.'s mineral properties in British Columbia in 1999, drilled the Southeast zone of the **Sustut** volcanic-hosted redbed copper zone to upgrade the existing resource with a view to developing a starter pit.

In the southeast of the province, the most active exploration area in 1999, the search for Sullivan-type sedex deposits continued, but at a reduced scale, with several small diamond-drilling programs. (*e.g.* **South Findlay, Greenland Creek, Pyramid Peak, Bootleg, Cruz/Gas** and **Pakk**).

Other indicators also showed a positive trend. Compared to 1999, total exploration expenditures are up by 15%, new mineral claims recordings are up by 60%, and total metres drilled is up by 30%.

Statistics

Estimated provincial exploration expenditures for 2000 are $30 million, which only includes fieldwork expenditures. Included in this total are 46 exploration projects (versus 48 in 1999), with budgets in excess of $100 000. The number of mineral claim units recorded in 2000 is forecast at 27 800, compared to 16 815 in 1999, representing an increase of approximately 60%. Figure 1 presents the trends in exploration spending and mineral claim staking between 1971 and 2000. Figure 2 illustrates the number of new, forfeited and good-standing mineral units in the province between 1990 and 2000 and shows that the total number of mineral claims in good standing has been relatively constant since 1994. The number of Free Miner Certificates issued each year (Fig. 3) suggest that the 20-year decline may be bottoming out. Drilling in British Columbia during 2000 is estimated to total approximately 192 000 metres (versus 139 000 in 1999); of this, approximately 144 000 metres were for metals and 48 000 metres for coal.

During 2000, approximately 34% of exploration spending was around minesites. An estimated 34% of exploration expenditure was on advanced properties, and 32% on grassroots programs (Fig. 4). Minesite exploration expenditures were once again dominated by programs at **Eskay Creek** (13%) and **Myra Falls** (8%).

MINING HIGHLIGHTS

Final production figures for operating mines will be included in the forthcoming annual publication, *Exploration and Mining in British Columbia*. The locations of the ten metal, eight coal, thirteen (of 41) industrial mineral mines and one tailings project that were in operation in 2000 are indicated on Figure 7. During 2000 the B.C. mining industry employed a workforce of about 8500 (*see* Table 1; Figure 5; Figure 6).

- The value of solid mineral production for 2000 is estimated at $2.84 billion, representing an increase of 8% from 1999(Fig. 5). The increase resulted primarily from increased production in copper, particularly from the **Highland Valley Copper** and **Kemess** mines, and zinc from the **Myra Falls** mine.
- Highlights of metal mine operations included a successful seasonal heap-leach operation at the **Golden Bear** gold mine in the northwest, and operational improvements at the **Kemess** gold-copper mine in the Toodoggone district. At the **Eskay Creek** mine there was record production of gold and silver, and mill production increased at the **Mount Polley** operation.
- Copper represents 25% of total solid minerals production value, projected at $707 million, a 42%

increase over 1999. This increase is principally the result of higher copper production at **Highland Valley Copper** and **Myra Falls**, and to a lesser extent at the **Mount Polley** and **Kemess** mines. Copper prices were also approximately 12% higher than in 1999.

- Gold production is forecast to be 25 million grams (807 000 oz), up 1% from 1999, and valued at about $336 million. Increases were recorded at **Eskay Creek**, **Kemess** and **Golden Bear**.
- Silver output is estimated to be 584 million grams (18.2 million oz), up 15% from 1999, and valued at $140 million. The bulk comes from **Eskay Creek**, with 438 560 kg (14.1 million oz); **Myra Falls** is the second largest producer of silver in the province.
- Zinc production is estimated to be 143 million kilograms worth $260 million, and lead output is forecast to be 42 million kilograms valued at $33 million. This is a 12% and 5% increase in production for zinc and lead, respectively, due primarily to higher production at **Myra Falls**.
- Molybdenum production is estimated to be 7 million kilograms, valued at $57 million. The 10% increase results from higher production at **Highland Valley Copper.** Other Molybdenum producers in B.C. are **Endako** and **Huckleberry**.
- The forecast value of structural materials, at approximately $420 million, is up 1% over last year; while industrial minerals at approximately $51 million, is down 1.4%. There are approximately 1100 construction aggregate operations in the province.
- Clean coal production in 2000 is expected to total about 25.6 million tonnes, with a forecast value of approximately $816 million, or approximately 29% of the total solid mineral production. The reported value is at the mine gate and does not include rail and port costs, which are paid by the customer.

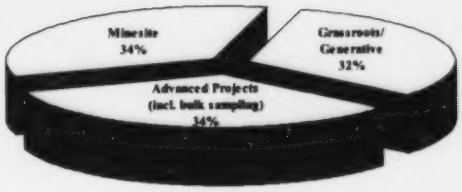
OPERATIONS

Mine production and reserves for 2000 are listed in the Table 1.

Metal Mines

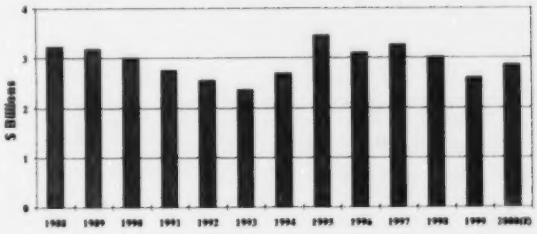
The **Eskay Creek** massive sulphide, underground gold-silver mine, owned and operated by Homestake Canada Inc., is the fifth largest silver producer in the world and one of the highest grade gold and silver mines. Direct shipping ore is blended on site (approximately 300 tonnes/day), trucked to load-out facilities at Stewart and Kitwanga and shipped to smelters in Japan and Quebec. In addition, the gravity flotation mill, with throughput of around 250 tonnes/day, produces precious metals in high-grade concentrates, with approximately 60% recovered in the gravity circuit and 40% by flotation. Mill production was increased to

Figure 4 ...



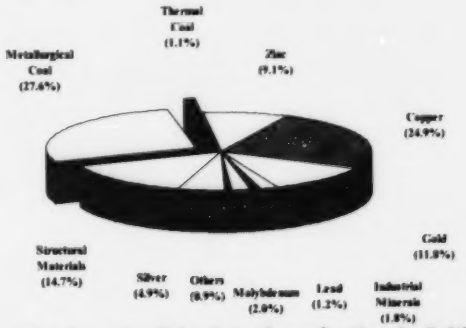
Exploration expenditures 2000; by level or category of program

Figure 5 ...



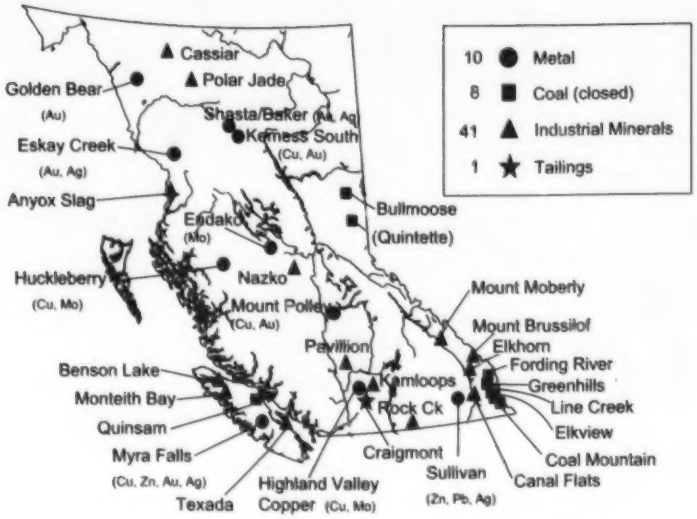
Solid mineral production value in British Columbia: 1988 to 2000

Figure 6 ...



Forecast value of solid mineral production in British Columbia; by percentage of total value - 2000

Figure 7 ...



Operating Mines in British Columbia - 2000

handle increased production from the NEX zone. Production is forecast by the company to be in excess of 10 260 kilograms (330 000 oz) of gold and approximately 438 560 kilograms (14.1 million oz) of silver, both record annual outputs. The total cash cost, for the first 9 months of 2000, was US $124 per ounce of gold equivalent. The mine employs 236 persons. The total past production, reserves and resources at Eskay Creek are about 7 million ounces of gold equivalent.

During 2000, over 22 000 metres of exploration drilling was completed at the minesite and in the immediate vicinity. The primary exploration work tested the down-plunge potential to the north-northeast of the NEX and HW zones, below the Bowser Lake Group sedimentary succession. Drilling also tested the west and east limbs of the ore zone. Test mining was carried out on the 21C footwall rhyolite zone.

The **Highland Valley Copper** porphyry copper-molybdenum mine, a partnership among Cominco Ltd. (50%), Rio Algom Limited (33.6%), Teck Corporation (13.9%) and Highmont Mining Company (2.5%), is one of the largest operations in the world, ranking fourth or fifth on the basis of daily mill throughput of about 135 000 tonnes. Since the start of the partnership in 1986, over 650 million tonnes of ore have been milled. In 1999 the mine was temporarily closed from mid-May until October and was re-opened after agreeing to a five-year, risk-sharing labour agreement that ties wages to the price of copper. The mine has been in full operation during 2000 and production costs were reduced by 5%. The mine employs about 950 people. South of the mine, a 180-kilometre induced polarization survey was completed in 2000.

The **Myra Falls** mine, owned by Boliden-Westmin Ltd., has been in production since 1966. In excess of 20 million tonnes of massive sulphide, Cu-Zn-Au-Ag ore has been mined from several orebodies along a 6-kilometre northwest trend. The mine plan has been developed to 2012; daily mill capacity is 4000 tonnes. Average annual production is projected to be 60 to 70 000 and 15 to 18 000 tonnes of zinc and copper in concentrate, respectively. Approximately 700 kilograms (22 500 oz) of gold are also produced. 2000 production came mainly from the H-W deposit, the 43 block, the Battle-Gap deposit and the bottom of the old Lynx open pit. Average cash costs are expected to be US$0.40 per pound of zinc. Exploration expenditures at Myra Falls in 2000 were the second largest in the province; work included over 17 000 metres of drilling (15 000 m underground; 2000 m surface). The program focused on gaining additional information on known resources to improve reserve/resource estimates and better assess mining potential. These resources are the Ridge Zone East and West located to the west of Battle-Gap, the Extension Zone to the west of the H-W deposit and the Price deposit accessed from Thelwood Valley on the east side of the property. In 2001, the company plans to continue exploration in the Ridge zones with drilling and development in 10 level of the Lynx mine. Drilling will also be carried out from surface in the area between the Lynx and Myra mines, from 13 level of the Price mine to test an area to the east of the H-W deposit, and from 4 level of the Price mine, testing the Price deposit.

At the **Golden Bear** mine, a Carlin-type deposit, Wheaton River Minerals Limited and North American Metals Corporation completed a very successful fourth year of seasonal heap-leaching (approximately five summer months). The mine employs 65 persons. Production during 2000 was approximately 2940 kilograms (94 500 oz) of gold, at a total cash cost of US$180 per ounce. A total of 295 026 tonnes grading 8.3 g/t Au was mined from the Ursa zone pit and crushed and stacked on the Totem Creek heap-leach pad. A further 90 887 tonnes of material grading

0.4 g/t Au, previously designated as waste, was added to the pad, together with 85 581 tonnes grading 7.2 g/t Au mined from underground in the Kodiak B zone. Mining activities ceased in 2000. Production in 2001 and 2002, estimated to total 870 kilograms (28 000 oz) of gold, will come from stockpiles and residual leaching.

Northgate Exploration Ltd., the new owner of the **Kemess** porphyry Au-Cu mine, improved mining, milling and transportation operations significantly in 2000. The mine employs approximately 400 workers. Four different ore types (leached cap, supergene, transitional and hypogene) are mined. Milling treats each ore type in separate batches, to maximize metal recovery. The mill is expected to soon meet its operating target of 48 000 tonnes per day. During the third quarter, gold and copper production rose 3% and 42%, respectively, compared to the second quarter. During the same period, gold recovery improved 10% to 67.9% and copper recovery improved to 78.8%. During October, the average production cost dropped to US$170 per ounce of gold, net of copper credits. Annual production is forecast around 8710 kilograms (280 000 oz) of gold and 24 950 tonnes (55 million pounds) of copper. The company also completed exploration drilling programs on the Kemess Centre and Kemess North targets, located approximately 2 kilometres northwest and 5 kilometres northeast of the mine, respectively. Encouraging results at both targets will lead to additional drilling in 2001.

The **Mount Polley** porphyry gold-copper mine, owned and operated by Imperial Metals Corporation (52.5%) and SC Minerals Canada Ltd. (47.5%), a wholly-owned subsidiary of Sumitomo Corporation of Japan, operated at a daily milling rate of 19 000 tonnes. The mine had a solid year of operation although the Job Protection Commission economic arrangement expired during the year. Expanded exploration drilling programs targeted zones south of the Cariboo pit (C-2, 207 zones) and elsewhere on the property (Southeast, Rad zones). Reverse-circulation drilling on the Southeast zone was successful in identifying potentially economic mineralization.

During 2000, Imperial Metals, under a joint venture agreement with Wildrose Resources Ltd., assessed the economics of the **Spanish Mountain (CPW)** gold prospect for possible mill feed to the Mount Polley operation. A 1950-tonne bulk sample from the LE zone was processed. Mining and limited follow-up drilling resulted in a revision in the companies' concept of ore controls, suggesting new exploration opportunities.

Huckleberry Mines Ltd., owned by Princeton Mining Corporation (50%) and a consortium for Mitsubishi Materials Corporation, Dowa Mining Company Ltd., Furakawa Company Ltd. and Marubeni Corporation (50%), milled approximately 20 000 tonnes of ore daily at the **Huckleberry** porphyry copper-molybdenum open-pit mine. All millfeed came from the Main Zone pit. More ore was discovered on the north wall of the pit and production was about 30% more than expected. Exploration drilling included the east and southwest areas of the East Zone pit early in 2000, plus a late-season program west of the tailings pond to investigate till geochemical anomalies. Imperial Metals also drill tested (4 holes) the Creek Zone of the **Whiting Creek** porphyry copper-molydenum deposit, 8 kilometres north-northwest of the mine.

Cominco Ltd's **Sullivan SEDEX Zn-Pb-Ag** mine employing 622 persons is scheduled to close at the end of 2001. Sullivan supplies 40% of the zinc concentrate and 80% of the lead concentrate treated in the Trail smelter; the remainder comes from Cominco's Red Dog mine in Alaska and a number of smaller operations worldwide. Since 1923, when the Sullivan concentrator started treating ore, approximately 150 million tonnes of ore grading 6.2% Pb and 5.6% Zn have been processed. At today's metal prices, production to the end of 2000 represents a total value of nearly $19 billion. Production in these last years of mine life has come from pillar recovery and ore remnants.

At the **Endako** porphyry molydenum mine, Thompson Creek Metals Company (75%) and Nissho Iwai (25%) continue milling at a daily rate of approximately 28 000 tonnes. The mine employs 218 persons. Installation of the in-pit crusher and conveyor ramp was completed. Mine life was estimated at seven years. Due to the low prices of molybdenum, the mine issued a 12-week lay-off notice to employees in November. The mine is working with the Job Protection Commission to develop a relief agreement until the price improves.

Sable Resources Ltd. mined 8580 tonnes of gold-silver ore from its **Shasta** epithermal vein deposit in the Toodoggone district. Head grades averaged 10.29 g/t gold equivalent. The ore was processed at the company's nearby **Baker** mill. Trenching and induced polarization programs were completed on the Vein A and B zones.

In the fall, Taseko Mines Ltd. and Gibraltar Mines Ltd. (wholly owned by Taseko Mines Ltd., a member of the Hunter Dickinson Group) announced plans to re-open the **Gibraltar** porphyry copper-molybdenum mine in 2001. Cominco Ltd.'s wholly-owned subsidiary, Cominco Engineering Services Ltd. (CESL), has signed a Memorandum of Agreement with Gibraltar Mines Ltd. to investigate the feasibility of building a 35 000 tonnes per year capacity copper refinery at the Gibraltar mine near Williams Lake. The facility would utilize CESL's proprietary hydrometallurgical technology; it could be up and running by mid-2002 and would cost around $90 million. Taseko and Gibraltar have retained Procorp Services Limited Partnership of Vancouver to provide technical, financial and marketing services related to all facets of the startup, expansion and development of the Gibraltar mine and the planned new refinery. More than 280 jobs would be created when operations resume in mid-2001. Successful implementation of the new hydrometallurgical technology would induce evaluation and re-evaluation of other copper deposits and mining operations throughout the province.

Kinross Gold Corporation's **QR** skarn-gold mine continued on care-and-maintenance status. Reserves estimated by the company as of January 1, 2000, were 320 000 tonnes grading 5.08 g/t Au. Big Valley Resources Inc. continued negotiations to buy the mine.

TABLE 1 - Mine Production and Reserves

Mine	Operator	Deposit Type	Forecast Production in 2000	Reserves (at Jan. 1, 2000)
Metals				
Endako	Thompson Creek Metals Company	Porphyry Mo	3,553,372 kg Mo (3rd qtr)	80 million tonnes at 0.074% Mo
Eskay Creek	Homestake Canada Inc.	Epithermal VMS	10 264 kg Au, 438 560 kg Ag	747 000 tonnes @71 g/t Au & 3282 g/t Ag (direct shipping) 713 500 tonnes @ 30.7 g/t Au & 1357 g/t Au (milling)
Golden Bear	Wheaton River Minerals Ltd.	Carlin (vein)	2940 kg Au	407,496 tonnes at 8.7 g/t Au
Highland Valley	Cominco Ltd./Rio Algom Ltd./ Teck Corp./Highmont Mining Co.	Porphyry Cu-Mo	13,300,000 kg Cu, 1,281,504 kg Mo, 48,318 kg Ag, 349 kg Au (3rd qtr)	387 million tonnes at 0.42% Cu and 0.008% Mo
Huckleberry	Huckleberry Mines Ltd.	Porphyry Cu-Mo	23,910,521 kg Cu, 406,742 kg Mo, 5573 kg Ag, 269 kg Au (3rd qtr)	15 593 000 tonnes @ 0.519% Cu, 0.014% Mo, 0.071 g/t Ag & 2.27 g/t Ag 46 169 000 tonnes @ 0.48% Cu, 0.014% Mo, 0.056 g/t Au, 2.95 g/t Ag (East zone)
Kemess South	Northgate Exploration Ltd.	Porphyry Au-Cu	5172 kg Au, 15,974,734 kg Cu, 4871 kg Ag (3rd qtr)	163 million tonnes at 0.23% Cu, 0.67 g/t Au
Mount Polley	Imperial Metals Corporation	Porphyry Au-Cu	12,524,473 kg Cu, 1870 kg Au, 1960 kg Ag (3rd qtr)	N/A
Myra Falls	Boliden Limited	VMS	12,559,602 kg Cu, 37,618,172 kg Zn, 1,109,774 kg Pb, 8460 kg Ag, 452 kg Au (3rd qtr)	7.7 million tonnes @ 7.3% Zn,1.4% Cu, 0.5% Pb, 38.9 g/t Ag, 1.40 g/t Au
Shasta/Baker	Sable Resources Ltd.	Epithermal vein	8580 tonnes @ 10.29 g/t Au equiv.	N/A
Sullivan	Cominco Ltd.	Sedex	71,604,795 kg Zn, 30,646,899 kg Pb, 13,766 kg Ag (3rd qtr)	4.6 million tonnes at 6.4% Zn, 3.3% Pb, 18 g/t Ag
Industrial Minerals				
Benson Lake	International Marble & Stone Co. Ltd.	Limestone	40,000 tonnes	
Craigmont	Craigmont Mines Joint Venture	Tailings, magnetite	60,000 tonnes	1 million tonnes
Elkhorn	Westroc Inc.	Evaporite	500,000 tonnes gypsum	4 million tonnes
Giscome	Pacific Lime Products Ltd.	Limestone	10,000 tonnes	
Harper Ranch	Lafarge Canada Inc.	Limestone	115,000 tonnes	16 million tonnes
Moberly	Mountain Minerals Co. Ltd.	Silica sandstone	120,000 tonnes	10 million tonnes
Monteith Bay	Monteith Bay Resources Ltd.	Hotsprings silica	37,000 tonnes	1.8 million tonnes
Mount Brussilof	Baymag Mines Co. Limited	Replacement	200,000 tonnes magnesite	17.6 million tonnes
Nazko	Canada Pumice Corporation	Volcanic cinder	10,000 tonnes	45 million tonnes
Pavilion	Graymont Western Canada Inc.	Limestone	200,000 tonnes	
Red Lake	Western Industrial Clay Products Ltd.	Lacustrine diatomite	6000 tonnes Fuller's earth	
Sumas Fireclay	Sumas Clay Products Ltd.	Fireclay	25,000 tonnes	
Texada (Gillies Bay, Blubber Bay, Imperial)	Ash Grove Cement Company, Holnam West Ltd., Imperial Limestone Co. Ltd.	Limestone	5 million tonnes	
Cassiar	Cassiar Magnesium Inc.	Asbestos		6 million tonnes
Hardy Island	Hardy Island Granite	Granite	3600 tonnes	
Coal				
Bullmoose	Teck Corporation	Metallurgical coal	1.7 million tonnes	5.8 million tonnes
Coal Mountain	Fording Coal Limited	Metallurgical coal	2.3 million tonnes	45 million tonnes
Elkview	Teck Corporation	Metallurgical coal	4.1 million tonnes	129.7 million tonnes
Fording River	Fording Coal Limited	Metallurgical coal	9.2 million tonnes	231 million tonnes
Greenhills	Fording Coal Limited	Metallurgical coal	4.3 million tonnes	128 million tonnes
Line Creek	Luscar Ltd.	Metallurgical coal	2.5 million tonnes	38.1 million tonnes
Quinsam	Quinsam Coal Corp.	Thermal coal	0.24 million tonnes	33.3 million tonnes
Quintette	Teck Corporation	Metallurgical coal	1.3 million tonnes	Closed Aug.17, 2000

Coal Mines

Total coal exports in 2000 are expected to be about 25.6 million tonnes, of which about 24 million tonnes will be coking and the remainder thermal. The value of production (ex-minesite) is estimated at $786 million for metallurgical coal and $32 million for thermal coal, for a total value of $816 million, down approximately 14% from 1999. The average price of coal sold FOB at the companies' load-out facilities in 2000 is about C$52.50, compared to about C$56 in 1999. Coal mining in British Columbia directly employed about 2700 workers, down from 3200 in 1999. About half of the metallurgical coal produced in British Columbia is shipped to Japan; the remainder is exported to some 20 different countries.

The year 2000 saw substantial restructuring in the coal mining industry in western Canada. In British Columbia, most mines continued to operate at capacity; however, the **Quintette** mine, in the northeast coal block, closed in August. The **Bullmoose** mine continues to operate and is scheduled to close in 2003. In the southeast, Luscar Ltd. is negotiating the sale of 50% ownership in the **Line Creek** mine to Consol of Canada. The company has been a joint venture partner with Luscar in the Cardinal River, Alberta mine for over 30 years. Consol of Canada is a wholly owned subsidiary of Consol Energy of Pittsburg, the fourth largest coal mining company in the USA.

Total expenditures on exploration at existing coal mines are projected at approximately $2.1 million, a 25% increase over 1999. Most of the spending was on in-pit drilling, totalling approximately 48 300 metres, undertaken to refine short-term mine plans.

At the **Quinsam** mine on Vancouver Island, Quinsam Coal Corporation restructured its finances and has sold about 0.24 million tonnes of thermal coal in 2000 in domes-

tic markets (mainly cement plants). The workforce has been reduced to less than 40 people.

In the Elk Valley, **East Kootenay** region, approximately 2000 people are employed at five operating mines, with a gross payroll of $150 million per year. The mines provide an estimated 6000 direct and indirect high-paying jobs.

The **Fording River** mine, operated by Fording Coal Limited, is the largest coal mine in British Columbia. It mined about 9.2 million tonnes, an increase of approximately one million tonnes over 1999. The higher production was achieved without increasing the manpower of about 800. Exploration expenditures in 2000 totalled $380 000, and 6750 metres of drilling was completed. This included four deep drillholes on the northwest side of Turnbill Mountain. Mining is concentrated in the Eagle Mountain and Henretta pits.

At the **Greenhills** mine, Fording Coal Limited expects to have shipped approximately 4.3 million tonnes in 2000, up from the 4.2 million tonnes in 1999. About $215 000 was spent on in-pit drilling. This included five deep holes and the cumulative depth drilled was 4237 metres.

The **Coal Mountain** mine, operated by Fording, is expected to have sold about 2.3 million tonnes, including about 0.3 million tonnes of thermal coal. In 1999, 2.1 million tonnes were sold. The workforce has remained unchanged from 1999 at about 170 people. Exploration drilling, which was mainly in-pit, cost $400 000 and totalled 5165 metres. Some regional mapping was undertaken.

The **Line Creek** mine, operated by Luscar Ltd., estimated shipments of about 2.5 million tonnes in 2000, which is similar to that shipped during 1999. Production comprised 2 million tonnes metallurgical and 0.5 million tonnes thermal coal. With the closing of the Gregg River, Alberta mine, a number of trucks have been transferred to Line Creek. Exploration during 2000 was mostly in pit, including 25 000 metres of drilling for a total cost of about $600 000.

Improved sales from the **Elkview** mine have allowed it to increase production from 2.7 million tonnes in 1999 to 4.1 million tonnes. There are plans to further increase production to 5.2 million tonnes in 2001. Teck Corporation owns the mine and with the closure of its Quintette operation, it has been able to move equipment south to Elkview. The workforce has increased by approximately 80 people. Exploration expenditures totalled $265 000; work included about 7150 metres of drilling. Most of the drilling was in-pit but a number of holes (total of 3000 metres) were drilled in the northwest corner of the Natal West pit to better define areas where the 10 seam is repeated by thrust faulting.

In the northeast, Teck Corporation supplied metallurgical coal exclusively to Japan from the Quintette and Bullmoose open-pit mines near Tumbler Ridge. The agreement with a consortium of eight Japanese steal mills is in effect until March 2003.

The **Bullmoose** mine (Teck Corporation, 60.9%; Rio Algom Limited, 29.1%; Nissho Iwai Coal Development Canada Ltd., 10%), operated by Bullmoose Operating Corp., estimated production at about 1.7 million tonnes, and expects the same in 2001 and 2002. Mine closure is planned for June, 2003. The labour force is similar to last year, at around 250 people. It might decrease in subsequent years as the strip ratio decreases. There was no exploration in 2000 and its unlikely that there will be any in the future.

The **Quintette** mine, operated by Quintette Operating Corp. and managed by Teck Corporation, closed on August 15, 2000, after producing 1.3 million tonnes. The mine opened in 1984 and over its life produced about 68 million tonnes. The plant was decommissioned after production ceased and equipment not utilized at Teck's other operations is for sale.

Industrial Mineral Mines

British Columbia produces a wide variety of industrial minerals and interest is increasing steadily. There are more than 40 operating mines and quarries and at least 20 sites where upgrading of industrial minerals into value-added products takes place. These operations are located mainly in the southern half of the province, close to existing infrastructure and markets. The most economically significant commodities produced in 2000 were sulphur, magnesite, gypsum, white calcium carbonate, limestone, silica, dimension stone, chrysotile asbestos and construction aggregate. Others produced in lesser quantities include jade (nephrite), magnetite, dolomite, barite, volcanic cinder, pumice, clay, fuller's earth and zeolites.

Sulphur, a byproduct of natural gas, is produced at a number of processing plants in northeastern British Columbia by West Coast Energy Inc., Petro-Canada Inc., Trans Canada Midstream and Amoco Canada Petroleum Company Ltd. Liquefied SO_2 and sulphuric acid are also produced at the Trail smelter.

In the Rocky Mountains, Westroc Inc. produces approximately 500 000 tonnes of **gypsum** annually from its **Elkhorn I** and **II** quarries near Windermere. Reserves are expected to last approximately ten years. During 2000, Westroc conducted a modest exploration program on its **Kootenay West (Koot)** gypsum property northeast of the Canal Flats. It is not likely to transfer production to this deposit before 2005. Georgia Pacific Canada Inc. is mining **gypsum** from its **Four J** quarry southeast of Canal Flats. Both Westroc and Georgia Pacific operate wallboard plants in the Vancouver area. The Georgia Pacific plant is dependent, to a large extent, on imported materials and supplements its raw gypsum needs with recycled gypsum. The Westroc plant is supplied by the Elkhorn quarries. Lafarge Canada Inc. mines a small quantity of gypsum from its **Falkland** pit for use in its cement plant near Kamloops.

Baymag Mines Company Limited continues to mine **magnesite** at **Mount Brussilof** in southeastern B.C. at a annual rate of about 200 000 tonnes. Over the last ten years, improvements in grade control and systematic blending of magnesite from different parts of the mine have resulted in consistent feed for the sintering plants. The company operates two such plants in Alberta.

Two **silica** mines in the Golden area, for many years accounted for most of the high-grade silica production in Brit-

ish Columbia. The Silica Division of Highwood Resources Ltd. produces approximately 120 000 tonnes at **Mt Moberly**, for shipment to Springfield, Oregon, Lavington, B.C. and other destinations. The **Horse Creek** mine owned by Silicon Metaltech of Seattle and operated by Nugget Contracting Ltd., closed in 1998 because of the shutdown of the Wenatchee metallurgical-grade silicon and ferrosilicon plant. In 2000, Monteith Bay Resources Ltd. supplied 37 000 tonnes of silica to the Tilbury Cement Ltd. plant in Delta, from its quarry at **Monteith Bay** on western Vancouver Island.

The largest centre of **limestone** production is **Texada Island**, where two quarries, the **Gillies Bay** (Texada Quarrying Ltd.) and **Blubber Bay** (Ashgrove Cement), ship some five million tonnes annually to customers in British Columbia, Washington, Oregon and California, mainly for cement, chemical and agricultural use. Over one million tonnes of crushed rock are sold annually as construction aggregate. Limestone is processed by three cement plants and two lime plants in British Columbia. The majority of pulp and paper mills produce their own lime from nearby limestone quarries. In 2000, Graymont Western Canada Inc. acquired all the properties of Continental Lime Ltd., including the **Pavillion Lake** limestone quarry and lime plant near Cache Creek, which produces about 200 000 tonnes of lime per year. The **Kamloops** cement plant of Lafarge Canada Inc. is producing about 115 000 tonnes of cement annually from the **Harper Ranch** quarry. Lafarge modernized its plant in Richmond, increasing the annual capacity to 1.0 million tonnes of cement. It is using limestone from Texada Island, coal from the Quinsam coal mine and silica mainly from Fraser River sands.

White calcium carbonate is produced from deposits on **Texada Island** (**Vananda** and **Gilles Bay**), **Benson Lake** on Vancouver Island and **Lost Creek** near Salmo. White calcium carbonate, depending on quality and degree of processing, has a variety of uses including paper, paint and plastic filler, and terrazzo chips.

Dolomite is quarried by IMASCO Minerals Ltd. at **Crawford Bay** on Kootenay Lake and by Mighty White Dolomite Ltd. near **Rock Creek**. Dolomite is used for soil conditioning, white ornamental aggregate, for stucco and roofing, as a fine aggregate, and for synthetic marble products.

British Columbia currently has only one producer of **barite** following closure in 1999 of the **Parson** mine by Highwood Resources Ltd. There was no mining at the **Fireside** barite quarry east of Watson Lake in 2000. Product was stockpiled onsite from 1999 production when approximately 18 300 tonnes of ore was processed.

Clayburn Industries Ltd. of Abbotsford processes locally mined **fireclay** from **Sumas Mountain** into a variety of refractory brick and castable refractory products. Its **pyrophyllite** property at **Princeton** is dormant, as the company moved its diatomite-based insulating brick production to Alberta. Small quantities of **flueline pipe** and ornamental and **facing bricks** are also produced near Abbotsford by Sumas Clay Products Ltd.

Western Industrial Clay Products Ltd., in Kamloops, supplies approximately half of the **kitty litter** market (and other domestic and industrial absorbents) in Western Canada, principally from its **Red Lake diatomaceous earth** (fuller's earth) quarry near Kamloops. The company ships product overseas. In addition, it is evaluating the marketing of "leonardite" or "humate" soil conditioner from a humic acid-bearing, carbonaceous layer which is sandwiched between two diatomaceous earth horizons at the mine site. Western Industrial Clay Products Ltd. has optioned the **Bee** and **Brom** zeolite properties at Princeton from Gordon Webster, and is mining small quantities of bentonite from the nearby **Bud** property.

The Limeco Products Division of Highwood Resources Ltd. continues to develop agricultural applications and markets in Alberta for **zeolite**, from the **Ranchlands Z-1** quarry near Cache Creek. There was no mining in 1999 or 2000 as the company relied on stockpiled ore. In 1998, the **Z-2** deposit reverted to the C_2C Mining Corporation and by early 1999, sales of bulk and packaged absorbents began from its Ashcroft processing and packaging plant. Zeo-Tech Enviro Corp. conducted bulk sampling on its **Zeo** property at Princeton in 2000. The company is preparing an application for a 75 000 tonnes per year quarry and continues to undertake joint demonstration and research studies with various partners. These studies will document the benefits derived from the application of zeolite blended with animal manure and other organic waste in the reduction of odours and the increase in nutrient retention. C_2C Mining and Zeo Tech Enviro Corp. have formed an alliance for processing, product and technology development, and marketing of **zeolite** from their deposits in the Cache Creek and Princeton areas, respectively. Canmark International Resources Inc. continues to develop a market in the Lower Mainland for zeolite from its **Sunday Creek** deposit near Princeton.

Granite and **marble** are produced by several companies. Stone-processing plants are operated by Westcoast Granite Manufacturing Inc. in Delta, Margranite Industries in Surrey, Matrix Marble Corporation in Duncan and Garibaldi Granite Group Inc. in Squamish. Margranite is processing a variety of imported granite and nine granite varieties from at least three quarry sites located in the East Anderson River, Beaverdell and Skagit Valley areas. In 1999 it doubled its plant capacity by adding a wire saw and hydraulic splitter. In 2000 the company further expanded its operation by installing two state-of-the-art gangsaws each with 150 blades and the ability to cut three international size blocks of granite simultaneously. A new, completely automated, slab polishing line was also installed. Garibaldi Granite owns a modern processing plant in Squamish where it processes three varieties of granite from four local quarries. It also produces some specialty products from columnar basalt and rhyolite.

In 1999, Westcoast Granite Manufacturing Inc. installed a second gangsaw, a new wire saw and a new crane at their processing facility in Delta. Quadra Stone Ltd. started production of Cascade Coral blocks from a new quarry near **Beaverdell**. Other active quarry sites include: Tsitika Stone Industries on northern Vancouver Island (grey granite), Yoho National Stone Inc. near Sayward, Hardy Island Granite Quarries Ltd. on Hardy Island and Adrea Natural Stone Supplies Ltd. on Granite Island near Sechelt. Matrix Marble Ltd. was developing a new site near the old **Tahsis Inlet**

quarry and owns a marble quarry near Cowichan Lake; however, there was no mining activity in 2000. The **Kingfisher** marble quarry near Enderby has been inactive since 1999.

Flagstone has traditionally been quarried by Revelstoke Flagstone quarries and Begbie Flagstone Ltd., together producing approximately 200 tonnes of mica-schist flagstone. Kootenay Stone Centre, and at least two other operators, produce **quartzite flagstone** from a number of small quarries in the West Kootenays. One local company produces flaggy sandstone on a small scale near **Port Renfrew** on Vancouver Island. Near Kelowna, the Kettle Valley Stone Company produces flagstone, ashlar, thin veneer and landscape rock products from several quarries. The most popular rock is a buff-tan dacitic ash (Mountain Ash) from **Nipple Mountain**, but the company also sells columnar basalt (Shadow Ridge) and "Rainbow" gneiss. These products are sold in northwestern USA, the Okanagan, Lower Mainland, Whistler and Alberta.

Jade (nephrite) production in 2000 was concentrated in the **Kutcho Creek** and **Serpentine Lake** areas in northwestern British Columbia. Jade West Resources Ltd. and its affiliated company, Polar Gemstones Ltd., were the most active producers in that region. Jade West also operates a jade-processing facility in south Surrey.

Canada Pumice Corporation produced red and black **tephra** from its **Nazko** quarry west of Quesnel. Current production is at a rate of about 15 000 cubic metres annually. The deposit contains a resource in excess of 44 million tonnes. The material from Nazko is used for landscaping, sporting facilities, growing and filtration media, and light weight aggregate applications. On a smaller scale, Great Pacific Pumice Ltd. is shipping **pumice** from its **Pum** property on Mount Meager, north of Pemberton. Recently, the company completed a ground radar survey to map the thickness of the pumice deposit.

M-Seven Industries Inc. produces between 60 000 and 70 000 tonnes per year of **magnetite** for industrial applications by processing the **Craigmont** mine tailings. The company supplies most coal mines in western Canada with material for heavy media coal upgrading.

The **insulation/mineral wool** manufacturing plant in Grand Forks, previously operated by Enertek, was acquired by Rockwool International A/S. It is now operated by a subsidiary company, Roxul (West) Inc. Testing of potential new raw materials is underway at several sites in the area.

Production of **chrysotile** at the former Cassiar site resumed in early 2000. Cassiar Magnesium Inc., formerly Cassiar Mines & Metals Inc., dry milled surface stockpiles, with approximately 6 million tonnes of 7% fibre outlined, to produce 60 to 70 tonnes per day of long and intermediate fibre. In 1999, Cassiar announced that it had signed a memorandum of understanding with Aluminum of Korea Ltd. to develop a magnesium project that will use the serpentine material from the tailings. The dry mill facility was damaged by fire in December 2000 and production has been suspended.

Pacific Abrasives & Supply Inc. is producing and processing slag for a variety of applications from Grand Forks dumps, but mainly for sandblasting at major shipyards and for roofing granules. Some slag was also shipped from **Anyox** by Tru-Grit as abrasives for use in the cement industry, mainly in the Vancouver area, and for roofing granules and other abrasive applications. Cominco Ltd. is also a major producer of slag from operations at the **Trail** smelter. It markets this product mainly for cement production and abrasive applications. Slag recovered in the Greenwood area is used as one of the raw materials in the production of mineral wool by Roxul (West) Inc. in **Grand Forks**.

EXPLORATION HIGHLIGHTS

METALS

Exploration targets in 2000 were varied (Fig. 8) but, as in 1999, there was an emphasis on polymetallic massive sulphide deposits. Exploration for these, which includes volcanogenic, sedex and subaqueous hot-spring types, accounted for about 36% of expenditures. Porphyry and vein targets attracted 22% and 16% of exploration spending respectively. The former reflects a general resurgence in base metal exploration, the latter reflects low gold prices. The search for platinum group elements in British Columbia attracted about 2% of exploration spending.

The highlights of the 2000 exploration season include a number of new discoveries throughout the province, *e.g.*, **Bonanza Ledge, Fox, Spire, Broken Hill** and **Silver Lynx.** (*see* Table 3; Fig. 9).

A number of projects are at Stage 2 of the Environmental Assessment Process, *i.e.*, **Silvertip, Red Chris,** and **Tulsequah Chief. The Sustut Copper** and **Black Crystal graphite** projects may enter the Process in 2001.

Figure 11 illustrates the location of some of the major exploration projects undertaken in 2000. Major exploration projects with expenditures in excess of $100 000, are listed in Table 2.

Massive Sulphide Deposits

Redhawk Resources Inc., in a joint venture with London-based ZincOx Resources Plc, is exploring the zinc oxide potential of the past-producing, carbonate-hosted Reeves MacDonald and Annex mine properties (collectively referred to as the **Remac** project). The project is located approximately 35 kilometres southeast of Cominco's Trail smelter and 16 kilometres north of the Pend D'Oreille zinc mine in Washington State, where Cominco Ltd. recently announced a production decision. Sulphide ore, grading 10-15% combined lead and zinc was produced from the mines between 1949 and 1971, but the extensive, overlying zinc-oxide capping was not mined due to the lack of extraction technology at that time. The zinc oxide deposits occur over a distance of 3 kilometres, extend from surface to a depth of up to 450 metres and contain zinc grades comparable to those of the primary sulphides. Redhawk conducted a trenching and 2600-metre reverse-circulation drilling program to confirm the structural continuity and overall zinc grades of the oxidized zones. Highlights of the program included: Hole

R-2000-02 (zone B) which assayed 15.43% Zn and 1.55% Pb over 5.3 metres, and Hole R-2000-09 (zone C) which assayed 8.68% Zn and 4.27% Pb over 12.2 metres. Follow-up drilling is planned for 2001. Metallurgical testing to demonstrate that zinc metal can be economically extracted from the oxides using new recovery technology is planned for 2001.

Several sedex targets were explored and drilled in the search for a Sullivan-type deposit in the Purcell Basin of southeastern British Columbia. At the **South Findlay** project, 30 kilometres north of the Sullivan mine, Rio Algom Exploration Inc., under option agreement with Eagle Plains Resources Ltd., drilled three holes totalling approximately 2600 metres to test the favourable Lower Aldridge - Middle Aldridge (LMC) contact defined by geological mapping in 1999. On the **Greenland Creek** project, which adjoins the South Findlay property to the southwest, Kennecott Canada Exploration Inc., also under a joint venture agreement with Eagle Plains Resources Ltd., drilled a single 295-metre hole to test a prominent zinc-in-soil geochemical anomaly delineated during 1999. Both of the above option agreements with Eagle Plains have since been terminated.

At the **Pyramid Peak** project just west of the Sullivan mine, Rio Algom, under an option agreement with Abitibi Mining Corporation, completed two diamond-drill holes, both targeting the favourable Sullivan horizon (LMC contact). Rio Algom, under an option agreement with Eagle Plains, also drilled one hole on the **Bootleg** property, which adjoins the Pyramid Peak property on the east.

On the **Pakk** project, approximately 35 kilometres southwest of Sullivan, Chapleau Resources Ltd. under an option agreement with Super Group Holdings Ltd., completed a modest diamond-drilling program on the Lower Jack zone. Chapleau also drilled 1900 metres in five holes on the **Pit** property, optioned from Black Bull Resources Inc. and located 4 kilometres south of the Sullivan mine. Chapleau also completed one drill hole on Abitibi Mining Corp.'s Gas claims, part of its larger **Cruz** project, south of Moyie Lake.

During 2000, Newmont Exploration of Canada Limited, under an option agreement with Rimfire Minerals Corp., completed a program of pulse-electromagnetic and magnetic geophysical surveys, prospecting, mapping and geochemical soil sampling over the 21-kilometre long **RDN** property, approximately 40 kilometres north-northwest of the Eskay Creek mine. The stratigraphic setting is similar to that at Eskay Creek. Drill targets were defined for 2001.

Hudson Bay Exploration and Development Co. Ltd., under an option agreement with Eureka Resources Ltd., completed a multifaceted exploration program on the **Lottie** volcanogenic massive sulphide target, 25 kilometres northwest of Wells. Hudson Bay flew the eastern portion of the Lottie-Bow claim groups with its Spectrem fixed-wing geophysical system. Geological mapping, prospecting, geochemical and geophysical surveys were conducted over the property. The work detailed the occurrence of high-grade copper float in glacial till and colluvium, discovered by prospector Martin Peter who optioned the property to Eureka in 1999. In September-October, 2000, Hudson Bay conducted trenching in the discovery zone and drilled four short holes targeting a 900-metre long ground EM conductor southeast of where high-grade copper boulders were discovered; no source for the boulders was found.

Gitennes Exploration Inc.'s **Fox** property covers the new Blacktop showing of zinc-rich polymetallic massive sulphide mineralization hosted by intermediate volcanic rocks of the Nicola Group. The showing was located in July, 2000, 27 kilometres north of Merritt, by prospector-geologist Michael Moore, and is partially exposed over a strike length of 100 metres in a Coquihalla Highway roadcut. The mineralized zone is characterized by sphalerite-pyrite-chalcopyrite-galena-tetrahedrite mineralization associated with sericite alteration and chert-barite. Since October, Gitennes completed a 475 line-kilometre, helicopter-borne electromagnetic survey, mapping, prospecting and stream sediment sampling surveys within the property. Detailed induced polarization surveys were being conducted at year end and drilling may take place in early 2001. The Fox discovery led to a staking rush in the area and Fjordland Minerals Ltd. and Platinova A/S have also acquired ground.

Imperial Metals Corporation discovered polymetallic massive sulphide mineralization at the **Spire** prospect, approximately 7.5 kilometres southwest of its Goldstream milling facilities. The zone is characterized by massive to semi-massive sulphides (chalcopyrite-pyrite-sphalerite) across a true thickness of 3 metres. The mineralogy, texture and lithologies at Spire are similar to those at the **Goldstream** mine. In the fall, Imperial Metals completed seven short diamond-drill holes on the showing. The best hole intersected 0.51% copper and 1.08% zinc over 3.12 metres.

In the Likely area, 75 kilometres northeast of Williams Lake, Barker Minerals Ltd. continued geological mapping and geophysical surveys over its **Frank Creek** and **Ace** volcanogenic massive sulphide showings. Although the felsic rocks at Frank Creek are different from those at the Ace showing to the northeast, the proximity of the two zones in the Barkerville Terrane enhances the potential of discovery of more VMS deposits within the belt. A trench dug in 1999 by Barker Minerals exposed a 1.2-metre thick stratabound lens of massive, fine-grained pyrite with local bands of chalcopyrite, sphalerite and galena. Hostrocks are phyllites of the Downey succession. In 2000, a new showing of massive sulphide mineralization, SRC, was discovered 6 kilometres southwest of the Frank Creek showing. At least five new geophysical anomalies have been outlined on the Frank Creek project.

Near Johanson Lake, Phelps Dodge Corporation of Canada Ltd. completed a six-hole, 950-metre diamond-drilling program on its **Carruthers** massive sulphide prospect. Drilling targeted the projection of a narrow polymetallic sulphide horizon, hosted by graphitic mudstones, siltstones and sandstones of the Triassic Dewar Formation (Takla Group).

At the **Broken Hill** property, three new areas of stratabound zinc-lead, massive sulphide mineralization were discovered and staked by prospector-geologist Leo Lindinger, while working on a Prospectors Assistance Grant. Located 7 kilometres northeast of Avola in the North Thompson area, the Vista, Navan and Mike prospects are distributed over a strike length of 5.5 kilometres. Grab sam-

ples range up to 24% Zn, 5% Pb and 63 g/t Ag. The style of mineralization appears similar to the **Ruddock Creek** deposit, 23 kilometres east, which has an indicated resource of 1.5 million tonnes grading 8.4% Zn and 1.6% Pb. In the fall, Cassidy Gold Corporation optioned and enlarged the property and carried out preliminary geological mapping, prospecting and soil and gravity surveys.

Bruce Doyle discovered Zn-Pb-Cu-Ag-Au and barite mineralization on the **Silver Lynx** prospect, 30 kilometres west of Nelson. Cassidy Gold Corp. optioned the property late in the year and planned a geophysical survey on the prospect for January, to define drill targets for a winter drilling program.

Michael Moore discovered volcanogenic massive sulphide mineralization in altered Sicker Group volcanic rocks on the **Raven** property on Nootka Island, western Vancouver Island. He optioned the property to Cream Minerals Ltd., who subsequently completed a Dighem airborne geophysical survey over the target.

The **Tulsequah Chief** polymetallic volcanogenic massive sulphide deposit in northwestern British Columbia became subject to a reconvened Environmental Assessment Review because of a July 2000, court order which overturned the previously granted Project Approval Certificate. The review will focus on the road route and sustainability issues, particularly as they effect the local aboriginal people.

Porphyry and Related Deposits

Taseko Mines Ltd. completed an extensive geophysical survey over the **Gibraltar** property and defined several drill targets.

In 1999 DRC Resources Corp. acquired the subsurface rights to the **Afton** and **Pothook** pits near Kamloops. Ten holes drilled by Teck Corporation in 1973 and 1980 outlined an underground resource of 5.9 million tonnes grading 1.55% Cu, 1.61 g/t Au and 6.86 g/t Ag. DRC drilled 21 deep holes in 2000, confirming and expanding the Teck resource, and quantifying the presence of anomalous palladium in the mineralization. Mineralization consists of chalcocite, bornite and chalcopyrite in brecciated intrusive and volcanic rocks.

Pacific Booker Minerals Inc. completed a program of induced polarization and magnetometer surveys, excavator trenching and diamond drilling (21 holes) on its **Morrison** copper-gold-silver property, 65 kilometres northeast of Smithers, in a joint venture with Noranda Inc. Results indicate the porphyry system extends northwest; it is now defined as 1.2 kilometres long by 600 metres wide. A resource of 190 million tonnes grading 0.4% Cu and 0.2 g/t Au was originally calculated for the deposit by Noranda, based on relatively shallow drilling in the 1960s and 1970s.

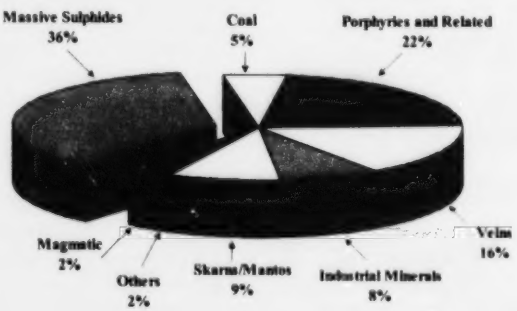
In the late fall, Eastfield Resources Ltd., under a recent option agreement with Lysander Minerals Corp., completed an initial diamond-drilling program on the Mackenzie zone, 11 kilometres south of the **Lorraine** deposits, as part of its ongoing investigations of the Jajay Ring mineral inventory. The drilling on the Mackenzie zone indicated a large area of intensely potassium-altered intrusive rocks. Follow-up surface geophysical and geochemical surveys are planned. Previously defined resources for the Lorraine/Bishop zone were estimated at 32 million tonnes grading 0.66% Cu, with accessory gold and silver. Two kilometres south of the Lorraine deposits, the company collected grab samples from the BM breccia zone to assess the platinum group potential of the Duckling complex. Palladium values, up to 3 g/t, were obtained from recent grab samples. The mineralization consists of a clast-supported breccia with a massive bornite matrix.

Re-examination of the voluminous data for the **Red Chris** copper-gold deposits by American Bullion Minerals Ltd. continued to focus on the potential to develop a smaller but higher grade resource (*i.e.,* 18 million tonnes grading 0.8% Cu and 0.86 g/t Au) utilizing underground caving mining method and an initial daily mill throughput of 8000 to 10 000 tonnes of ore. American Bullion is seeking a joint venture partner. The company plans to conduct in-fill drilling, metallurgical testing on the core, mine plan evaluation and a new feasibility study during 2001.

GWR Resources Inc. completed diamond drilling of more than 25 holes on its **Ann North** copper-gold property, 30 kilometres northeast of Lac La Hache. Mineralization consists of chalcopyrite and bornite within a zone of intense potassium feldspar flooding and quartz stockwork in a porphyritic quartz monzonite. Pyrite content is very low, and there are magnetite-chalcopyrite breccia zones. The best drill intersection assayed 0.21% Cu and 0.27 g/t Au over 112 metres, including 43 metres containing 0.31% Cu and 0.43 g/t Au.

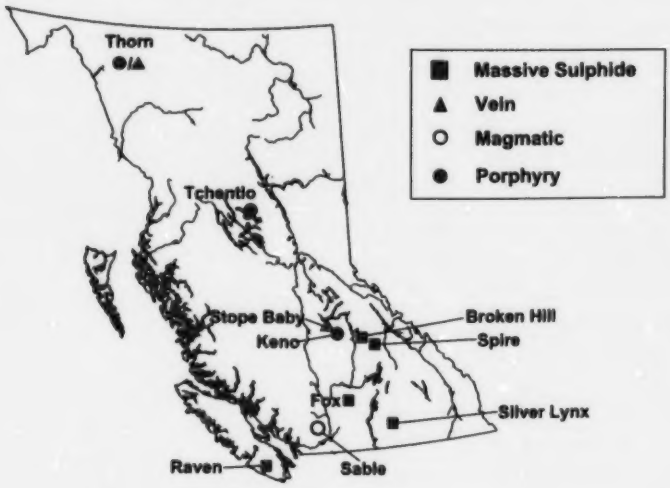
Sultan Minerals Inc. conducted geological and structural mapping, geochemical and geophysical (induced polarization) surveys and excavator trenching on its **Kena** gold-copper project near Nelson. The exploration program also included logging, splitting and assaying of approximately 1300 metres of diamond-drill core from the Kena Gold zone, which had been left unsplit by previous operators. On the recently identified Gold Mountain zone, three trenches contained a weighted average grade of 1.65 g/t Au over their combined length of 125 metres. The zone is underlain by the Silver King porphyry, which is known to have a higher background gold level than the surrounding volcanic rocks. An

Figure 8 ...



Exploration Targets 2000: by Deposit Type (%)

Figure 9 ...



New Discoveries in British Columbia - 2000

induced polarization survey over the zone defined a chargeability anomaly 1.8 kilometres in strike length and up to 400 metres wide. The results suggest that gold-bearing sulphide mineralization is present in both the Silver King porphyry and the adjacent Rossland Group volcanic rocks. The company believes that there is potential for a significant bulk-tonnage gold deposit on the property.

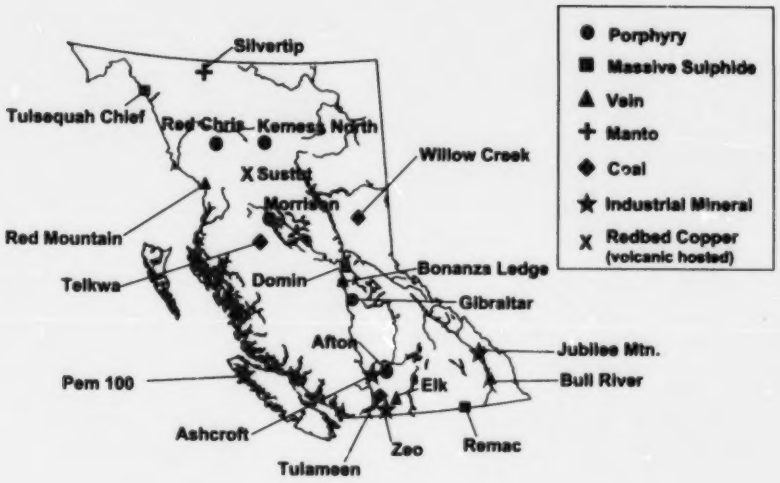
Precious Metal Bearing Veins and Bulk-mineable Deposits

While drilling the BC vein in March, International Wayside Gold Mines Ltd. discovered the **Bonanza Ledge** zone, approximately 3 kilometres southeast of the former **Cariboo Gold Quartz** gold mine near Wells. Its discovery sparked the largest staking rush in British Columbia since 1989. Staking covered a northwest-trending zone of lode gold mineralization and placers that can be traced discontinuously for 30 kilometres along the Wells-Barkerville belt. Since gold was discovered in the area in 1860, the belt has produced over 75 tonnes of gold from placers, and 38 tonnes of gold from lode deposits. The project area is underlain by an overturned, northeast-dipping sequence of metamorphosed Paleozoic clastic sedimentary rocks and limestone. Lode gold production from the Cariboo Gold Quartz, Island Mountain and Mosquito Creek Gold mines define a mineralizing system that is developed over a 4.5-kilometre strike length. Gold mineralization exhibits both strong structural and stratigraphic controls. Mineralization at the Cariboo Gold Quartz, Mosquito Creek and Island Mountain mines is developed within 150 metres of the overturned contact between interbedded quartzite, sericite phyllite and limestone of the Downey succession to the northeast, and carbonaceous metaturbidite rocks of the Hardscrabble succession to the southwest. Mineralization at the Bonanza Ledge is developed approximately 200 to 300 metres structurally below the contact. Two styles of mineralization, mesothermal quartz-pyrite veins and massive-pyrite replacement bodies, although distinct, may represent a syn-metamorphic and syn-deformational Jurassic(?) mineralizing event. The two varieties occur together within a broad zone of iron carbonate and sericite alteration.

Mineralization at **Bonanza Ledge** is broadly comparable to the replacement style, although the hostrocks differ, and the size of the Bonanza Ledge mineralized zone is larger. Gold occurs as discrete micron-sized native grains on fractures or grain boundaries in massive, banded and veinlet pyrite within a 20 to100-metre wide zone of intense, pervasive sericite, iron carbonate and pyrite alteration associated with bleaching of the host carbonaceous metasedimentary units. High-grade auriferous pyrite occurs in strongly sheared, northwest plunging, elongate zones that reach over 30 metres in thickness and have been traced along a strike length of more than 120 metres. Pyrite at Bonanza Ledge comprises up to 70% by volume of the mineralized rock, occurring as stringers, concordant layers and massive bands. Muscovite, dolomite/ankerite and quartz are the principal gangue minerals, together with lesser rutile and trace tourmaline.

International Wayside completed a program of geological mapping, soil geochemistry, ground geophysical surveys and a total of 48 diamond-drill holes. Outcrops of pyritic sericite and iron carbonate alteration in a similar stratigraphic position to Bonanza Ledge have been located 2 to 3 kilometres to the northwest, corresponding with a 1.2 kilometre long, gold-in-soil anomaly. The last six drill holes in the program stepped out approximately 300 metres to the northwest of the Bonanza Ledge zone to test the possibility of an extension to the mineralization as indicated by the geophysical surveys. Follow-up drilling will further evaluate this area and other targets on International Wayside's extensive land holdings.

Figure 10 ...



Advanced Projects in British Columbia - 2000

At the **Domin** gold project, 43 kilometres northeast of Wells, Gold City Industries Ltd. completed a program of vein sampling and diamond drilling. The property covers a 15-kilometre trend of sediment-hosted (argillite and limestone), mesothermal gold-silver-lead- zinc-bearing quartz veins along the geochemically anomalous Isaac Lake fault. The quartz veins are within multiple deformation zones exposed on surface over a 50 by 150-metre area. A bulk sample of this surface exposure by Noranda Inc. in 1992 consisted of 1180 tonnes grading 14 g/t Au. The 2000 drilling program focused on a 200-metre strike length of this South zone, and confirmed the existence of multiple veins with subvertical to 70° dips to the south. Approximately 200 metres along strike from the South zone is the 9600 anomaly, a 250 by 300-metre area of elevated geochemical values in gold, silver, lead and zinc similar to the South zone. In September, high-grade veins were discovered at the North zone, 450 metres north of the South zone, while prospecting a 400 by 500-metre soil geochemistry anomaly. The outcrops display similar geology, alteration and deformation to the South zone. A trenching and soil sampling program is proposed, to expand the South zone mineralization, as well as follow-up work on the recent North zone discovery.

Island Mountain Gold Mines Ltd., under an option agreement with International Wayside Gold Mines Ltd., conducted a modest diamond-drilling program near the Red Gulch drainage northwest of the **Mosquito Creek Gold** mine shaft. Drilling targeted replacement gold mineralization, associated with pyrite-bearing dolomitized or silicified limestone. Future drilling will test for both replacement and vein mineralization.

At the **Spanish Mountain** gold property, just southeast of Likely, Imperial Metals Corp., under an option agreement with Wildrose Resources Ltd., collected a bulk sample of approximately 1950 tonnes of material grading approximately 2.1 g/t Au, trucked it north to its Mount Polley mine, where it was mixed with Mount Polley ore for milling. Percussion drilling on five zones, together with the excavated LE zone, has led Wildrose to examine the potential for locating higher-grade zones of mineralization.

On the past-producing **Elk** (Siwash North) gold-silver property, 45 kilometres southeast of Merritt, Fairfield Minerals Ltd. completed a twelve-hole, 1400-metre diamond-drilling program. It targeted three gold-bearing quartz vein systems, the eastern extension of the Siwash North vein, mined from 1992 to 1994; the WD zone located 150 metres north of the Siwash North vein and the Gold Creek West area, 500 metres southwest of the open pit. The company reports that drilling results indicate good structural and grade continuity of the targeted vein systems. Prospecting in a new logging clearcut a kilometre east of the mine area discovered two northeast-trending structures coincident with anomalous gold values in soil. Previously-calculated indicated and probable resources at the Siwash North mine are 55 600 tonnes grading 49.06 g/t Au and 40 360 tonnes grading 34.83 g/t Au, respectively. A new resource calculation is in progress, incorporating results of the 2000 drilling program.

Wheaton River Minerals Ltd. studied the detailed mineralogy and timing of the alteration and mineralization using core from four well-drilled sections in the Marc, AV and JW zones on its **Red Mountain** mesothermal sulphide vein gold deposit, 15 kilometres east of Stewart which it purchased in 1999. Preliminary results confirm work by previous owners Lac Minerals Ltd. and subsequently Royal Oak Mines Inc., which outlined a resource of 12 million tonnes grading 2.54 g/t Au. Wheaton River is conducting a pre-feasibility study to assess the economics of mining, over four to five years, the high-grade core of the deposit which consists of 700 000 tonnes grading 12 g/t Au. The study is also ex-

Figure 11 ...

Selected Major Exploration Projects in British Columbia - 2000

amining the viability of relocating the company's Golden Bear mill to the site.

At the **Thorn** high-sulphidation, structurally controlled, pyrite-enargite-tetrahedrite epithermal vein system, 125 kilometres northwest of Telegraph Creek, Rimfire Minerals Ltd., under an option agreement with Kohima Pacific Gold Corp., completed an airborne 385-line-km, electromagnetic survey, mapping and prospecting, soil geochemical sampling and relogging and sampling of core from eight diamond-drill holes completed in 1986. Additional claims were staked as a result of the airborne survey. Sporadic exploration since 1963 identified numerous zones of mineralized veining hosted by a strong clay-sericite altered, quartz-feldspar-biotite porphyry exposed over a 2 by 1.5 km area During the 2000 season, Rimfire identified new massive pyrite-enargite-tetrahedrite vein showings (*e.g.* Catto and Tamdhu veins). Results from a soil geochemical survey over the core of the zone indicate good potential for finding additional mineralization. The relogging and selective resampling of core from the 1986 program led to the recognition of wider mineralized zones than previously reported. A major follow-up work program is planned for 2001.

National Gold Corp. optioned the **Zinger** gold project from the Kennedy Prospecting Group. The property, located in the Purcell Basin west of Cranbrook, was previously explored for gold in large quartz veins, but it is now recognized that lower grade gold is more widely dispersed in Proterozoic sediments, and associated with silicified zones and minor quartz veinlet stockwork development. Mineralization appears to be controlled by specific stratigraphic horizons adjacent to high-angle structures, over an area of approximately 3.5 square kilometres.

At the **Bull River** copper property in southeastern British Columbia, Gallowai Metal Mining Corporation and Bul River Mineral Corporation Ltd. continued underground development and exploration of the past-producing copper-silver mine. The companies claim that high values in gold and platinum are associated with the copper mineralization. However, selected sampling of sulphide-rich veins from core and underground, by geologists from the British Columbia Ministry of Energy and Mines, has not confirmed the high gold or the platinum values reported by companies. (*see* GeoFile 2000-6).

Skarn/Manto Deposits

At the high-grade **Silvertip** silver-lead-zinc, carbonate replacement deposit, 85 kilometres southwest of Watson Lake, Yukon, Imperial Metals Corporation and Peruvian Gold Ltd. completed a modest underground diamond-drilling program in January, 2000. The program tested the continuity and orientation of a late-1999 drill intersection which assayed 318 g/t Ag, 8.65% Zn and 5.53% Pb over 31.4 metres, and also tested several other geological targets. The companies believe that this mineralized zone forms part of a higher-grade feeder zone to overlying mantos. The property is reported to contain a measured, indicated and inferred resource of 2.57 million tonnes grading 325 g/t Ag, 8.8% Zn and 6.4% Pb. The 2000 program did not prove sufficient additional tonnage to justify a production decision at current metal prices; as a result, Peruvian Gold has given notice of withdrawal from the project.

Alpha Gold Corp. completed a 29-hole, 4680-metre diamond-drilling program on several auriferous skarn/manto and alkalic porphyry targets on its **Lustdust** property, 150 kilometres northwest of Fort St. James. At least four en echelon skarn zones, hosted by limestones and meta-argillites of the Permian Cache Creek Group, have been identified over a strike length of 2500 metres and a width of 500 metres. The

TABLE 2 - Major Exploration Projects - 2000

Property	Operator	MINFILE	NTS	Commodities	Deposit Type	Work Done
Afton Mine	DRC Resources Corp.	092INE023	92I/10E	Cu, Au, Pd, Ag	Alkalic Porphyry	est. 21 ddh, 8500 m
Ann North	GWR Resources Inc.	092P 115	92P/14W	Cu, Au	Alkalic Porphyry	26 ddh, ~5000 m
Black Crystal	Crystal Graphite Corp.	082FNW260	82F/13W	Graphite	Metamorphic	bulk samp; geophys; ~1000 m diamond drilling
Blu Starr	Hampton Court Resources Inc./ Anglo Swiss Resources Inc.	082FNW259	82F/12E	Gemstones	Metamorphic	prosp; geol; geophys; bulk sample; market testing
Bonanza Ledge	Intn'l Wayside Gold Mines Ltd.	093H 019	93H/4E	Au	Replacement, Mesothermal Vein	48 ddh, ~6000 m; geol; geophys
Bull River	Gallowai Metal Mining Corp / Bul River Mineral Corp Ltd	082GNW002	82G/11W	Cu, Ag, Au	Mesothermal Veins	u/g drifting & sampling; u/g & surface drilling
Carruthers Pass	Phelps Dodge Corp. of Canada Ltd.	N/A	94D/8E	Cu, Zn, Au	VMS	7 ddh, 1000 m; geophys
Chappelle - Baker mine	Sable Resources Ltd.	094E 026	94E/8E	Au, Ag, Cu	Epithermal Vein	8 ddh, ~700 m
Clearwater Platinum (Golden Loon)	Cusac Gold Mines Ltd.	N/A	92P/8W	Pt, Pd, Au, Cr	Ultramafic	230 m trenching; 11 line-km IP; geochem
Coal Mountain Mine	Fording Coal Ltd.	082GSE052	82G/7E,10E	Coal	Sedimentary	21 rcdh, 5185 m
Dominion Creek	Gold City Industries Ltd.	093H 133	93H/6	Au, Ag	Mesothermal Vein	17 ddh, 1000 m
Elk (Siwash North Mine)	Fairfield Minerals Ltd.	092HNE096	92H/16W	Au, Ag	Vein	12 ddh, 1400 m; prosp, geochem
Elkview Mine	Elkview Coal Corp.	082GNE015	82G/10W, 15W	Coal	Sedimentary	7150 m rc drilling
Eskay Creek	Homestake Canada Inc.	104B 008	104B/9W	Au, Ag	Epithermal VMS	drill access, 250 m; 51 ddh, 22 080 m
Fording River Mine	Fording Coal Ltd.	082JSE009, 10, 12	82J/2W	Coal	Sedimentary	6750 m rc drilling
Fox	Gitennes Exploration Ltd.	092ISE191	92I/07E	Zn, Cu, Pb, Au, Ag	VMS	IP; 475 line-km airborne geophys, geochem; geol
Gibraltar	Taseko Mines Ltd.	093B 012	93B/9W	Cu, Mo	Porphyry	237 line-km grid and IP
Greenhills Mine	Fording Coal Ltd.	082JSE001, 5, 7	82J/2W	Coal	Sedimentary	4237 m rc drilling
Greenland Creek	Kennecott Canada Expir Inc.	082FNE089,107, 112	82F/16E	Zn, Pb, Ag	Sedex	1 ddh, 295 m
Huckleberry	Huckleberry Mines Ltd.	93E 037	93E/11E	Cu, Mo	Porphyry	8 ddh, 1200 m
Jubilee Mountain	WWC Consulting Ltd.	082KNE079	82K/16W	Barite	Veins, Breccias	diamond drilling
Kemess	Northgate Exploration Ltd.	094E 021	94E/2E, 2W	Au, Cu	Porphyry	13 ddh, 3400 m; IP
Kena	Sultan Minerals Inc.	082FSW237,331, 332	82F/6W	Au, Ag, Cu	Porphyry	trenching; geochem; geophys
Kootenay West/East	Westroc Inc.	082JSW005	82J/4E	Gypsum	Evaporite	diamond drilling
Line Creek Mine	Luscar Ltd.	082GNE020, 21, 22	82G/15W,E	Coal	Sedimentary	25 000 m rc drilling
Lottie Lake	Hudson Bay Exploration and Development Co. Ltd.	N/A	93H/4E, 5E	Cu, Au	VMS	5 ddh, 700 m; test pitting; geol; geophys; geochem
Lustdust	Alpha Gold Corp.	093N 009	93N/11W	Au, Ag, Zn, Cu, Pb	Skarn, Manto	29 ddh, 4680 m
Morrison	Pacific Booker Minerals Inc.	93M 007	93M/1W	Cu, Au	Porphyry	trenching, 3200 m; 19 ddh, 6270 m
Mosquito Creek Gold	Island Mountain Gold Mines Ltd.	093H 010	93H/4E	Au	Replacement	10 ddh, 1754 m
Mount Polley	Imperial Metals Corp.	093A 008	93A/12E	Au, Cu	Porphyry	27 ddh, 4477 m; 148 pdh, 7500 m; geol
Myra Falls	Boliden-Westmin Canada Ltd.	092F 071, 073, 330	092F 12E	Cu,Zn,Au,Ag	VMS	15 000 m u/g diamond drilling 2000 m surface diamond drilling
Nimpkish	Graymont Western Canada Inc.	092I 186	092I 07W	Limestone	Sedimentary	2484 m diamond drilling
Pakk/Pil	Chapleau Resources Ltd.	082FNE054, 061, 062, 101, 110	82F/9E,W	Be, Rb, Ta, REE, Zn, Pb, Ag	Pegmatite, Sedex	14 ddh, ~4540 m; prosp
Pem 100	Tilbury Cement Ltd.	092L 063, 150, 289	092L 12E	Silica (Chalky Geyserite)	Epithermal	25 ddh; bulk sample
Pyramid Peak	Rio Algom Exploration Inc.	082FNE084, 087	82F/9E	Zn, Pb, Ag	Sedex	2 ddh, 1553 m
RDN	Rimfire Minerals Corp.	104G 144	104B/15, 104G/2	Au, Ag	Epithermal VMS	geol; grid, 30 line-km; Pulse EM & Mag, 30 line-km; soil geochem
Remac	Redhawk Resources Inc. / ZincOx Resources	082FSW024, 026, 219	82F/3W	Zn, Ag, Pb (oxides)	Sedex, Replacement (weathered)	21 rcdh, ~2600 m; trenching
Ruth Vermont	MineQuest Exploration Assoc. Ltd.	082KNE009, 010, 011, 037	82K/15W	Ag, Pb, Zn, Au	Vein, Sedex	5 ddh, ~725 m
Silvertip	Imperial Metals Corp. / Peruvian Gold Ltd.	104O 038	104O/16	Ag, Zn, Pb	Manto	22 u/g ddh, 3210 m
SKU (Pimainus)	Cominco Ltd.	N/A	92I/6, 7	Cu, Mo	Porphyry	180 line-km grid and IP
South Findlay	Rio Algom Exploration Inc.	082KSE041,53, 63	82K/1E	Zn, Pb, Ag	Sedex	3 ddh, 2579 m
Spanish Mountain	Imperial Metals Corp.	093A 043	93A/11W	Au	Mesothermal Vein	2150 tonne bulk sample
Spire	Imperial Metals Corp.	N/A	82M/10E	Cu, Zn	VMS	7 ddh, 720 m
Stanley	Castle Metals Corp.	093H 001-003 082-083, 099-100	93H/4W	Au	Mesothermal Vein	trenching; geol; geochem; geophys
Sustut Copper	Doublestar Resources Ltd.	094D 083	94D/10E	Cu, Ag	Volcanic Redbed	22 ddh, 2105 m; geol; geochem
Thorn	Rimfire Minerals Corp.	104K 031	104K/10	Au, Ag	Epithermal	airborne EM-Mag, 385 line-km; geol, prosp; soil geochem
Wood	Lakewood Mining Co. Ltd.	092INE165	92I/09W	Cu	Alkalic Porphyry	5 ddh, 1418 m
Zeo (Bromley Vale)	Zeo-Tech Enviro Corp.	092HSE166	92H/07E	Zeolite	Industrial Mineral	2200 tonne bulk sample; engineering and marketing studies

2000 drilling tested high-grade copper, zinc and gold mineralization to depth and along strike from intersections cut in the Canyon Creek skarn zone during the 1999 program. Alpha reports that the 2000 program significantly increased the depth and grade of copper-gold resources along a strike length of at least 475 metres. The drilling indicates that width and grade increase with depth and to the west. An expanded program is planned for 2001.

Goldcliff Resource Corporation has acquired a large block of ground east of the former Nickel Plate mine, the largest known gold skarn in Canada. The property hosts two significant gold skarn prospects, **Panorama Ridge** and **Nordic**.

Volcanic-hosted Redbed Copper Deposit

Doublestar Resources Ltd. conducted a 1768-metre diamond-drilling program on its **Sustut** volcanic-hosted, redbed copper project, 115 kilometres north of Smithers. Seventeen drill holes intersected the Southeast zone. Mineralized intercepts averaged 1.89% Cu and 6 g/t Ag over an average thickness of 18 metres. The Southeast zone is proposed as a starter pit for a contemplated 2000 to 4000 tonne-per-day open-pit mine. Based on 2000 drilling and past drilling by Falconbridge Ltd., Snowden Mining Consultants estimated a total resource for the Southeast zone of 7 970 000 tonnes grading 1.54% Cu and 5.1 g/t Ag, at a 0.50% Cu cutoff. During 2001, the Southwest zone (3 954

TABLE 3 - New Discoveries and Prospecting Highlights - 2000

Property or Claim Name	Location	Discoverer	Company or Status	Option to	Type
BONANZA LEDGE	4 km SE of Wells	Ned Reid	Int' Wayside	N/A	Vein-mesothermal
FOX	27 km N of Merritt	Michael Moore	Consultant	Gitennes	Zn-rich VMS
SPIRE	7.5 km SW of Goldstream mine	Craig Lyons	Consultant	Imperial Metals	VMS - Besshi
BROKEN HILL (Vista/Navan)	7 km NE of Avola	Leo Lindinger	Prospector (PA)	Cassidy Gold	Massive sulphide (Sedex)
SILVER LYNX	~20 Km W. of Nelson	Bruce Doyle	Prospector (PA)	Cassidy Gold	V-mes, VMS skarn
KENO	32 km SE of Horsefly	Herb Wahl, Jack Brown-John	N/A	N/A	Porphyry (Mo-Cu)
RAVEN	Nootka Is.	Michael Moore, Paul Metcalfe		Cream Minerals	VMS
THORN	120 km SE of Atlin	Henry Awmack	Rimfire	N/A	High-sulphidation epithermal vein/porphyry
SABLE	~50 km NW of Giant Mascot Mine	Murray McLaren	Prospector (PA)	N/A	Mag - PGEs
STOPE BABY	Horsefly area			Erin Ventures	Vein-mesothermal
FOX (1 - 6)	25 km E of Boss Mtn.	Dave Ridley	Prospector (PA)	N/A	W-Mo-Zn skarn
TCHENTLO	N side of Tchentlo Lk.	Lorne Warren	Prospector (PA)	N/A	Por
DAVE	8 km SSW of Lillooet	Gary Polischuk	Prospector (PA)	N/A	Vein-mesothermal
SCR	SE end of Cariboo Lk.	Louis Doyle	Barker Minerals		VMS

Note: PA = funding from Prospectors Assistance Program; N/A = not applicable

000 tonnes grading 1.25% Cu) and the North zone (8 657 000 tonnes grading 0.73% Cu) will be brought to the same resource status as the Southeast zone and a full feasibility study will start. Metallurgical testing is ongoing, with presently indicated copper recoveries of approximately 79%.

Magmatic Deposits

Although exploration expenditures for Ni ± PGE bearing magmatic deposits only accounted for about 2% of total expenditures, significant ground acquisitions were made and exploration for these targets is expected to increase in 2001.

The **Giant Mascot** mine, near Hope, produced 26 573 090 kilograms of nickel and 13 212 770 kilograms of copper from 4.2 million tonnes of ore grading 0.77% Ni and 0.34% Cu between 1958 and 1974. Massive and disseminated sulphide deposits are hosted in a small (2 by 3 kilometres) plug of ultramafic rocks emplaced in highly metamorphosed rocks. Although resources were identified in 26 pipe-shaped orebodies, approximately 66% of production came from five of them. Most of the orebodies plunge steeply northwest. Records show that there is local enrichment of platinum, palladium, gold and silver. The current owner, Homestake Canada Inc., focused its work on completing reclamation at the minesite; no exploration is planned. However, as a result of the significant price increase for PGEs, renewed interest in this area has resulted in a mini-staking rush along a belt extending at least 50 kilometres northwesterly from the minesite. In addition, exploration targeted ultramafic rocks in the areas northwest of Spuzzum and North Bend. Other PGE projects include; **Sable, Cogburn, Jason** and **Emory Creek**. Elsewhere in the province, minor exploration programs investigated elevated PGE concentrations (especially palladium) in **alkaline porphyry** deposits (*e.g.*, **Lorraine, Dobbin** and **Afton**), in Alaskan-type ultramafic intrusive complexes (*e.g.*, **Turnagain**) and mineralization associated with mafic intrusions associated with flood basalts (*e.g.*, **Kluane Belt** in Yukon and northwesten British Columbia and the **Karmutsen Formation** on Vancouver Island).

COAL

There was little coal exploration in 2000 apart from in-pit drilling at the producing mines. However, interest in coalbed methane (CBM) in the province is intense reflecting significantly higher natural gas prices and increased success in recovering CBM in the USA. Alberta Energy Corporation drilled a number of core holes in the **Elk Valley** coalfield which provided coal samples for gas desorption tests and information on stratigraphy. A land sale in the northeast raised about $10 million, based mainly on CBM interest. There has also been interest in developing the CBM potential of the **Comox** coalfield on Vancouver Island.

During 2000, off-lease coal exploration was undertaken at **West Brazion, Wolverine and Tulameen.** Expenditures

are estimated at approximately $170 000, up from the $130 000 spent in 1999.

At the **Willow Creek** project, 45 kilometres west of Chetwynd, Pine Valley Coal Limited (owned jointly by BC Rail, Mitsui-Mitsushima and Globaltex) has approval to excavate a 100 000-tonne sample and, in the winter of 2000 - 2001, plans to mine 50 000 tonnes for sale in the spring. BC Rail has constructed a spur line and Pine Valley Coal is preparing a load-out and stockpile area; preparation has cost Pine Valley about $250 000.

Also in the northeast, Western Canadian Coal Corporation is studying the development potential of a number of properties. A single hole was drilled on the **West Brazion** property, about 40 kilometres south of Willow Creek confirming that the coal is coking quality. There appears to be an area of 400 hectares where a cumulative thickness of 8 metres of coal dips consistently at 4° to 6° and may be amenable to open pit mining. The company also mapped the **Wolverine** property, located adjacent to the BC Rail line 23 kilometres west of Tumbler Ridge. The property has underground room-and-pillar mining potential.

Pacific West Coal Limited obtained a mine development permit for its **Tulameen** project in August, 2000. About 10 tonnes of coal were collected and sent to Calgary for washability and plant modeling studies. The company plans to extract a bulk sample in 2001 and begin small-scale production with a mobile wash plant later in the year. Coal would be trucked to markets in the Lower Mainland and the USA. The low sulphur content makes the product attractive as a thermal coal.

INDUSTRIAL MINERALS

In 2000, industrial minerals exploration expenditures are estimated at approximately $1.9 million, down from the $2.4 million in 1999. Some noticeable trends are that grassroots exploration for traditional construction materials and lightweight aggregate are gradually expanding from the Lower Mainland along the British Columbia coast line. It is expected that over the next ten years, crushed stone from the coast will make significant inroads into the Vancouver area aggregate market.

IG Machines and Fibers Ltd., a subsidiary of IKO Industries Ltd., proceeded with plant construction for its **Ashcroft** basalt quarry and roofing granule operation. The facility will produce up to 250 000 tonnes per year of granules which will be crushed, sized and colored on site, prior to shipping to IKO Industries shingle plants in Sumas, Washington State and Calgary.

Wollastonite claims north of Rossland, originally staked by prospector Horst Klassen, are now being evaluated as a potential source of wollastonite to be used as a natural flux at the Cominco Smelter in Trail.

Crystal Graphite Corp., formerly I.M.P. Industrial Mineral Park Mining Corp., has announced plans to develop its **Black Crystal graphite** property on Hoder Creek west of Slocan. Production is planned at an initial mining rate of 300 000 tonnes per year starting in late 2001. In 2000 they conducted a 1000-metre exploration drilling program to better define the resource.

Anglo Swiss Resources Inc. entered a joint venture arrangement with Hampton Court Resources Inc. to continue work at its **Blu Starr** gemstone property in the Slocan Valley, which contains number of occurrences of **star sapphire, corundum, iolite** and **garnet**. In 2000, the joint venture completed prospecting and mapping, as well as sampling and testing of alluvial gravels on its coincident mineral and placer claims.

Graymont Western Canada Inc. is examining the process for advancing its proposed 250 000 tonne per year chemical limestone, **Var** quarry, on Rupert Inlet near Port Hardy, into the Environmental Assessment Process.

Tilbury Cement Ltd., under an agreement with Homegold Resources Ltd., drilled and bulk sampled its **Pem 100** chalky **geyserite** deposit, west of Port Hardy.

Homegold Ltd. completed a trenching program on its **Holyoak magnetite** prospect on southern Vancouver Island.

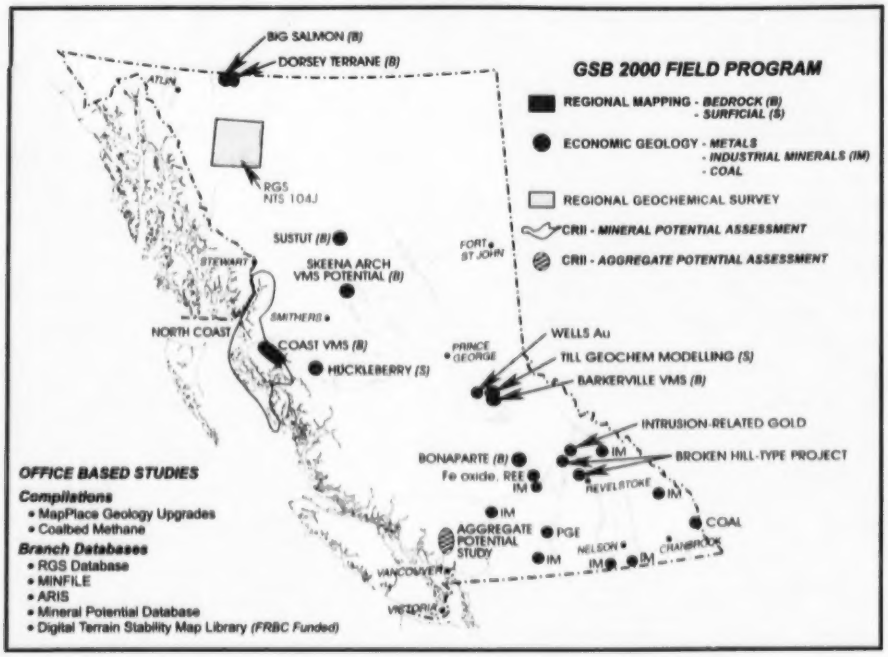
Several of British Columbia's extensive **magnesite** deposits have changed hands and are being re-examined. Near Marysville, Stralak Resources Inc. and joint venture partner Magna Precious & Industrial Metals Inc. took control of the **Marysville** sparry magnesite deposit from Cominco. This deposit has an inferred resource of 12.7 million tonnes grading 88% $MgCO_3$, most of it is amenable to underground mining. Occidental Petroleum dropped the Driftwood Creek property and the claims are now controlled by Kootenay Geo-Services Ltd. of Skookumchuck.

In 1999, W.W.C. Consulting Ltd., under an option agreement with prospector Art Louie, drove two adits on the Heli and Grizzly barite veins at **Jubilee Mountain**, west of Spillimacheen. The company shipped a few thousand tonnes of barite ore to the mill at the Elkhorn property in 1999, south of Windermere, which is owned by its parent company, Hydrotech Dynamics Ltd. of Calgary. No further mining was done in 2000, but a program of surface drilling tested several other veins and breccia zones on the property. The company is currently constructing a jig concentrator at the mine site, to enable it to pre-concentrate the barite prior to transporting it to the mill. Further underground development and bulk sampling are planned for 2001.

Rocky Mountain Tufa Ltd. continues to extract **tufa** from its extensive surficial deposit at **Brisco** and to market it to alpine gardening and landscaping suppliers throughout North America. Several other occurrences of tufa and **travertine** scattered along the east flank of the Rocky Mountain Trench have been staked and are being tested by local prospectors. Mapping was completed at the Tufa Rock Garden project in Kelowna.

Chapleau Resources Ltd. is re-evaluating part of the large Hellroaring Creek pegmatite intrusion on its **Pakk** property west of Kimberley for beryllium, rubidium, tantalum, tin and rare earths. Chapleau completed eight diamond-drill holes to test new beryl showings in the Hellroaring Stock which were found by prospectors earlier in the year. It is also logging and sampling core from 21 drill

Figure 12 ...



holes completed in 1986, that were not assayed for rare earth metals. In late November, Naneco Minerals Ltd. entered into a joint venture with Chapleau on the Pakk project.

GOVERNMENT INITIATIVES

During 2000, the Government of British Columbia continued a number of measures to assist mineral resource planning, exploration and development. It also continued support for the successful Prospectors Assistance Program and the field programs of the Geological Survey Branch. Highlights are as follows:

- The **British Columbia Mining Exploration Tax Credit Program (METC)** continued in its second year. Expenditures made during 2000 by eligible individuals or corporations conducting grassroots mineral exploration in British Columbia may qualify for a 20% refundable credit. In July, after consultation with the Province of British Columbia, the Federal Government amended regulations to the federal *Income Tax Act* to remove an impediment to companies wishing to flow through some or all of their METC benefits to their investors. The federal government also recently announced a temporary (Oct. 17, 2000 to Oct. 12, 2004), tax-assisted, exploration incentive program which will have the effect of reducing BC investors' net cost to approximately 35% of their original investment.
- **The Prospectors Assistance Program (PAP)** promotes grassroots prospecting for new mineral deposits in British Columbia. It contributed up to 75% of eligible costs for approved projects to a maximum of $10 000. Fifty-one grants were awarded in 2000 worth more than $430 000, which supported prospectors for more than 2500 prospecting days in the field. Several new discoveries were reported by recipients (*see* Table 3 and Fig. 9). A number of new discoveries made by prospectors over the past couple of years were worked on by mining companies under option agreements. The Ministry annually issues grants to seven mining sector organizations to help them deliver training programs to prospectors. The Ministry also provided basic prospector training.
- **Regional Geochemical Surveys (RGS)** samples for the Atlin (NTS 104N), Jennings River (NTS 1040) and McDame (NTS 104P) areas were re-analyzed for gold and 25 other metals and the results were released in June. This was part of the ongoing program of enhancing previously released survey results. In cooperation with the Geological Survey of Canada, RGS samples were collected in the Dease Lake (NTS 104J) area; results will be released in June, 2001. As well, target surveys to assist with land use planning were completed in the Ecstall River area (NTS 103H/I) and Porcher Island, Dundas Island and along the Inside Passage (NTS 103G/H/J). Results will be released in 2001.
- The **Geological Survey Branch** field programs (Fig. 12) continued to develop the geoscience database. The potential for massive sulphide deposits along the ancient Pacific margin (*e.g.*, Dorsey Terrane, Big Salmon Complex, Kootenay Terrane and Ingenika area) will

continue to be examined over the next three years, as part of a new multidisciplinary project with the Geological Survey of Canada and Yukon Geology Program. Three programs (mapping, mineral deposits and till sampling) were carried out in the **Wells-Barkerville belt**, where new discoveries have been reported. The potential for **Pogo, iron oxide Cu-Au-REE, and Broken Hill -type deposits** in the province was investigated, and mineral deposit models and geochemical models are being developed. The **Ecstall** massive sulphide and **Sustut** volcanic-hosted redbed copper deposit settings were also examined.

- A new project examining the **PGE** potential in British Columbia focused on the Whiterocks Complex and the **Dobbin** property in the southern interior. Two PGE GeoFile (digital publications) were posted to the Ministry web site (GF 2000-2 and GF 2000-5). Several smaller scale projects were carried out on **coal and industrial minerals**. A number of projects are in the write-up stage.
- During 2000 the Geological Survey initiated a new publication series which is available exclusively over the internet called **GeoFiles**. These digital products are designed to get information out quickly to clients; they are not necessarily subject to the same editorial standards as hardcopy publications. Using this medium, information will be made available to the public which previously may not have justified a hardcopy publication. (View or download these and other products at: ***www.em.gov.bc.ca/Mining/Geolsurv/Publications/)***
- The **ARIS** (assessment reports), **MINFILE** and **MapPlace** databases continue to be upgraded and made more easily accessible to clients, on the Ministry's website: ***www.em.gov.bc.ca/geology***. Assessment reports are now being routinely scanned and posted to the website.
- In partnership with the Geological Survey of Canada, an airborne geophysical survey was carried out in the Atlin area (NTS 104N); results will be released in 2001. A follow-up bedrock mapping program is being planned for 2001.

OUTLOOK FOR 2001

The renewed interest in base metal exploration, particularly for polymetallic massive sulphide and porphyry deposits, is expected to continue. The new federal *Exploration Investment Tax Credit* for flow-through share investors, coupled with the *B.C. Mining Exploration Tax Credit* is expected to provide a much needed boost for exploration financing in 2001 and future years.

The economic significance of the Eskay Creek mine continues to attract province-wide attention to the potential for stratabound, precious metal-enriched subaqueous hot-spring deposits.

Follow-up work on the large number of claims acquired during the staking rush in the Wells-Barkerville area during 2000 is expected to result in drill target identification on several projects in 2001. Exploration interest in the area is expected to expand to the northwest.

Similarly, the large number of claims staked as a result of the new Fox polymetallic VMS discovery, north of Merritt, will receive follow up work; drill target identification on several projects is anticipated.

The interest in the association of nickel ± PGEs with mafic to ultramafic rocks in British Columbia is expected to increase in 2001.

With the closure of the Sullivan mine scheduled for the end of 2001, the search for zinc-rich sedex deposits in the southeast part of the province is expected to continue, although not at the aggressive pace of the last few years.

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Internet access to B.C. Ministry of Energy and Mines geoscience information

B.C. Geological Survey Branch internet website
www.em.gov.bc.ca/Mining/Geolsurv/

GSB publications catalog
www.em.gov.bc.ca/Mining/Geolsurv/Publications/

GSB MapPlace
www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/

MINFILE - B.C. mines and mineral occurrence database
www.em.gov.bc.ca/Mining/Geolsurv/Minfile/

ARIS - Assessment Reports
http://www.em.gov.bc.ca/Mining/Geolsurv/Aris/

GSB Information for Public Education
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GeoFiles - digital geoscience maps and reports
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